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ADAPTIVE DISPLAY SYSTEM

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ADAPTIVE DISPLAY SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

This is a continuation-in-part of application Serial No. 10/316,562 filed December 11, 2002 entitled "Adaptive Display System" in the name of Zacks et al.

FIELD OF THE INVENTION

The present invention relates generally to display systems.

BACKGROUND OF THE INVENTION

Large-scale video systems such as rear and front projection television systems, plasma displays, and other types of displays are becoming increasingly popular and affordable. Often such large-scale video display systems are matched with surround sound and other advanced audio systems in order to present audio/visual content in a way that is more immediate and enjoyable for audience members. Many new homes and offices are even being built with media rooms or amphitheaters designed to accommodate such systems.

Increasingly, such large-scale video display systems are also being usefully combined with personal computing systems and other information processing technologies such as internet appliances, digital cable programming, and interactive web based television systems that permit such large-scale video display systems to be used as part of advanced imaging applications such as videoconferencing, simulations, games, interactive programming, immersive programming and general purpose computing. In many of these applications, the large-scale video display systems are used to present information of a confidential nature such as financial transactions, medical records, and personal communications.

Of particular value is the use of such large-scale video display systems as a component of medical information systems such as Hospital Information Systems (HIS) or Radiology Information Systems (RIS) that provide information management for medical data for patients admitted to hospitals or receiving outpatient care. In this environment such large-scale video display systems can be used to present a wide variety of patient related content such as

diagnostic images of the type that are generated by systems such as Computer Tomography, Ultra Sound, Magnetic Resonance Imaging, Digital Radiographic or Computer Radiographic, patient monitoring systems, and electronic patient medical record systems. Such large-scale video display systems can also be useful in videoconferencing applications of the type that are used for tele-medicine, tele-health and other forms of remote medical treatment and consultation.

One inherent problem in the use of such large-scale video display systems is that they present content on such a large visual scale that the content is observable over a very large presentation area. Accordingly, observers who may be located at a significant distance from the display system may be able to observe the content without the consent of the intended audience members. This problem is particularly acute in the medical industry as the privacy of medical records, diagnostic images and other medical information is of paramount importance. Policies at a medical facility and/or legal requirements may dictate that only designated physicians and staff members have access to particular medical images and other patient information. In addition, there may be various levels of restriction enforced. For example, attending one set of medical providers for a patient may have unlimited access to the complete medical record, including all images and patient data. However, another set of medical providers may be permitted access only to specific images and data relevant to a particular injury or treatment.

One way of preventing sensitive content from being observed by unintended audience members is to define physical limits around the display system so that the images presented on the display are visible only within a controlled area. Walls, doors, curtains, barriers, and other simple physical blocking systems can be usefully applied for this purpose. However, it is often inconvenient and occasionally impossible to establish such physical limits. Accordingly, other means are needed to provide the confidentiality and security that are necessary for such large-scale video display systems to be used to present content that is of a confidential or sensitive nature.

Another approach is for the large-scale video display systems to present images that are viewable within a very narrow range of viewing angles

relative to the display. For example, a polarizing screen can be placed between the audience members and the display in order to block the propagation of image modulated light emitted by the display except within a very narrow angle of view. This approach is often not preferred because the narrow angle of view limits the range of positions at which people can observe the images presented by the display.

Another approach involves the use of known displays and related display control programs that use kill buttons or kill switches that an intended audience member can trigger when an unintended audience member enters the presentation space or the audience member feels that the unintended audience member is likely to enter the presentation space. When the kill switch is manually triggered, the display system ceases to present sensitive content, and/or is directed to present different content. It will be appreciated that this approach requires that at least one audience member divide his or her attention between the content that is being presented and the task of monitoring the presentation space. This can lead to an unnecessary burden on the audience member controlling the kill switch.

Still another approach involves the use of face recognition algorithms. U.S. Pat. Appl. No. U.S. 2002/0135618 entitled "System And Method for Multi-Modal Focus Detection, Referential Ambiguity Resolution and Mood Classification Using Multi-Modal Input" filed by Maes et al. on Feb. 5, 2001 describes a system wherein face recognition algorithms and other algorithms are combined to help a computing system to interact with a user. In the approach described therein, multi-mode inputs are provided to help the system in interpreting commands. For example, a speech recognition system can interpret a command while a video system determines who issued the command. However, the system described therein does not consider the problem of preventing surreptitious or unauthorized observation of the contents of the display.

Thus what is needed is a display system and a display method for automatically adjusting the displayed content to ensure that confidential medical

images and records that are presented by the display system are presented in a manner that preserves the confidentiality of the records.

SUMMARY OF THE INVENTION

In a first aspect of the present invention, what is provided is a method for operating at least one display. In accordance with the method, personal identifiers are detected for people located in a presentation space within which patient content presented by the display can be observed and a profile is determined for each detected personal identifier. Patient content is obtained for presentation on the display based upon the profiles for each detected personal identifier and content is presented that is based upon the obtained patient content.

In another aspect of the present invention, a method is provided for operating a display. In accordance with the method, personal identifiers are detected for people in a presentation space in which content presented by the display can be observed and people in the presentation space are identified using the personal identifiers. An authentication signal is requested for each person. The authentication signal from each identified person is received and it is verified that the authentication signal for each identified person corresponds to an authentication signal template linked to the personal identifier for that person. Viewing privileges for the verified people are determined and the viewing privileges for the verified people are combined. Patient content is selected for presentation based upon the combined audience viewing privileges and access privileges associated with the patient content and at least a part of the selected patient content is presented.

In still another aspect of the present invention, a control system for a display is provided. The control system has a detector adapted to detect personal identifiers for people located in a presentation space within which patient content presented by the display can be observed and a processor adapted to determine a profile for each detected personal identifier in the presentation space based and to obtain patient content using the personal profiles. The processor causes the display to present content that is based upon the obtained patient content.

In a further aspect of the present invention, a control system for operating a display is provided. The control system comprises a detector adapted to detect personal identifiers associated with the people in a presentation space in which content presented by the display can be observed and an authentication system that generates an authentication signal in response to a person associated with a personal identifier. A processor is adapted to determine a profile for each detected personal identifier in the presentation space and to obtain patient content using the personal profiles. The processor causes the display to present content that is based upon the obtained patient content only where an authentication signal has been received for each personal identifier in the presentation space and where each authentication signal is found to correspond with an authentication signal template that is linked to the personal identifier.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a block diagram of one embodiment of an adaptive display system of the present invention;

Fig. 2 shows a flow diagram of one embodiment of a method for presenting images in accordance with present invention;

Fig. 3 shows a block diagram of another embodiment of an adaptive display system of the present invention;

Fig. 4 is an illustration of the use of one embodiment of the present invention for video conferencing;

Fig. 5 is an illustration of one embodiment of the present invention in conjunction with a medical information system;

Fig. 6 is a perspective view illustrating a display device 20 located in a viewing room;

Fig. 7 is a flow diagram illustrating one embodiment of the method of the invention.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 shows a first embodiment of a presentation system 10 of the present invention that adaptively presents content. As used herein, the term content refers to any form of video, audio, text, affective or graphic information or representations and any combination thereof.

In the embodiment shown in Fig. 1, presentation system 10 comprises a display device 20 such as an analog television, a digital television, computer monitor, projection system or other apparatus capable of receiving signals containing images or other visual content and converting the signals into an image that can be discerned in a presentation space A. Display device 20 comprises a source of image modulated light 22 such as a cathode ray tube, a liquid crystal display, an organic light emitting display, an organic electroluminescent display, or other type of display element. Alternatively, the source of image modulated light 22 can comprise any front or rear projection display system, holographic and/or immersive type display systems known in the art. A display driver 24 is also provided. Display driver 24 receives image signals and converts these image signals into control signals that cause the source of image modulated light 22 to display an image.

Presentation system 10 also comprises an audio system 26. Audio system 26 can comprise a conventional monaural or stereo sound system capable of presenting audio components of the content in a manner that can be detected throughout presentation space A. Alternatively, audio system 26 can comprise a surround sound system which provides a systematic method for providing more than two channels of associated audio content into presentation space A. Audio system 26 can also comprise other forms of audio systems that can be used to direct audio to specific portions of presentation space A. One example of such a directed audio system is described in commonly assigned U.S. Patent Application Serial No. 09/467,235, entitled "Pictorial Display Device With Directional Audio" filed by Agostinelli et al. on December 20, 1999.

Presentation system 10 also incorporates a control system 30. Control system 30 comprises a signal processor 32 and a controller 34. A supply of content 36 provides a content bearing signal to signal processor 32. Supply of content 36 can comprise, for example, a digital videodisc player, videocassette player, a computer, a digital or analog video or still camera, scanner, cable television network, the Internet or other telecommunications system, an electronic memory or other electronic system capable of conveying a signal containing content for presentation. Signal processor 32 receives this content and adapts the

content for presentation. In this regard, signal processor 32 extracts video content from a signal bearing the content and generates signals that cause the source of image modulated light 22 to display the video content. Similarly, signal processor 32 extracts audio signals from the content bearing signal. The extracted audio signals are provided to audio system 26 which converts the audio signals into an audible form that can be heard in presentation space A.

Controller 34 selectively causes images received by signal processor 32 to be presented by the source of image modulated light 22. In the embodiment shown in Fig. 1, a user interface 38 is provided to permit local control over various features of display device 20. For example, user interface 38 can be adapted to allow one or more audience members to enter system adjustment preferences such as hue, contrast, brightness, audio volume, content channel selections etc. Controller 34 receives signals from user interface 38 that characterize the adjustments requested by the user and will provide appropriate instructions to signal processor 32 to cause images presented by display device 20 to take on the requested system adjustments.

Similarly, user interface 38 can be adapted to allow a user of presentation system 10 to enter inputs that enable or disable presentation system 10 and/or to select particular channels of content for presentation by presentation system 10. User interface 38 can provide other inputs for use in calibration as will be described in greater detail below. For example, user interface 38 can be adapted with a voice recognition module that recognizes audible output and provides recognition into signals that can be used by controller 34 to control operation of the device.

A presentation space monitoring system 40 is also provided to sample presentation space A to detect elements in presentation space A that can influence whether certain content should be presented. As is noted above, presentation space A will comprise any space or area in which the content presented by the presentation system 10 can be discerned. Presentation space A can take many forms. For example, in the embodiment shown in Fig. 1, content presented by display device 20 is limited by wall 51. Alternatively, where presentation system 10 is operated in an open space such as a display area in a

retail store, a train station or an airport terminal, presentation space A will be limited by the optical display capabilities of presentation system 10. Similarly where, presentation system 10 is operated in a mobile environment, presentation space A can change as presentation system 10 is moved.

In the embodiment shown in Fig. 1, presentation space monitoring system 40 comprises a conventional image capture device such as an analog or digital image capture unit 42 comprising a taking lens unit 44 that focuses light from a scene onto an image sensor 46 that converts the light into electronic signal. Taking lens unit 44 and image sensor 46 cooperate to capture images that include presentation space A.

Images captured by image capture unit 42 are supplied to signal processor 32. Signal processor 32 analyzes the images to detect image elements in the images that are captured of presentation space A. Examples of image elements that can be found in presentation space A include audience member 50, 52, and 54 or things such as door 56 or window 58 or other items (not shown) that may have an influence on what is presented by presentation system 10. Such other items can include content capture devices such as video cameras, digital still cameras, or any other image capture device as well as audio capture devices.

A source of element profiles 60 is provided. The source of element profiles 60 can be a memory device such as an optical, magnetic or electronic storage device or a storage device provided by the remote network. The source of element profiles 60 can also comprise an algorithm for execution by a processor such as signal processor 32 or controller 34. Such an algorithm determines profile information based upon analysis of the elements found in the presentation space image captured by image capture unit 42 and assigns a profile to the identified elements as will now be described with reference to Fig. 2.

Fig. 2 shows a flow diagram of one embodiment of a method for operating a presentation system such as presentation system 10. As is shown in Fig. 2, the presentation system is initially calibrated (step 110). As is shown in Fig. 3, during calibration, calibration images including images of presentation space A are obtained (step 112). A user of presentation system 10 uses the calibration images to identify elements that are or that can be present in

presentation space A (step 114) and a profile is defined for each element (step 116).

The elements identified during calibration can include, for example, people such as audience member 50, 52 and 54 who are present in presentation space A. Such people can be identified using face recognition or other software to analyze the image or images of presentation space. In this regard, the calibration images used during calibration can include images of particular people or their specific characteristics which can be used by the face recognition software to help identify the people who are likely to be in the presentation space. Profile information is assigned to each person. The profile identifies the nature of the content that the person is entitled to observe. For example, where it is determined that the person is an adult audience member, the viewing privileges may be broader than the viewing privileges associated with a child audience member. In another example, an audience member may have access to selected information relating to the adult that is not available to other adult audience members. The profile can assign viewing privileges in a variety of ways. For example, viewing privileges can be defined with reference to ratings such as those provided by the Motion Picture Association of America (MPAA), Encino, CA, U.S.A. which rates motion pictures and assigns general ratings to each motion picture. Where this is done, each element is associated with one or more ratings and the viewing privileges associated with the element are defined by the ratings with which it is associated. However, it will also be appreciated that it is possible to assign profiles without individually identifying audience member 50, 52 and 54. This is done by classifying people and assigning a common set of privileges to each class. Where this is done, profiles can be assigned to each class of viewer. For example, people in presentation space A can be classified as adults and children with one set of privileges associated with the adult class of audience members and another set of privileges associated the child class.

Elements other than people can also be assigned profile information. Items such as windows, doors, blinds, curtains and other objects in presentation space A can be assigned with a profile. For example, door 56 can be assigned with a profile that describes one level of display privileges when the

image indicates that the door is open, another set when the door is partially open and still another set of privileges when the door is closed.

In another example, window 58 can be assigned with a profile that provides various viewing privileges associated with the condition of the window. For example the window and profile that defines one set of privileges when no observer is detected outside of window 58 and another set of privileges when an observer is detected outside of the window 58.

In still another example, the portions of presentation space A imaged by presentation space monitoring system 40 that do not frequently change such as carpet areas, furniture etc., can also be identified as static area elements. Static area elements can be assigned with profiles that identify viewing privileges that are enabled when the static area elements change during presentation of the image.

In a further example, various portions of presentation space A imaged by image capture unit 42 that are expected to change during display of the content but wherein the changes are not frequently considered to be relevant to a determination of the privileges associated with the content can be identified. For example, a large grandfather clock (not shown) could be present in the scene. The clock has turning hands on its face and a moving pendulum. Accordingly where content is presented over a period of time, changes will occur in the appearance of the clock. However, these changes are not relevant to a determination of the viewing privileges. Thus, these areas are identified as dynamic elements and a profile is assigned to each dynamic element that indicates that changes in the dynamic element are to be ignored in determining what content to present.

Finally, it may be useful to define a set of privilege conditions for presentation space A when unknown elements are present in presentation space A. For example, it may be useful to define a profile for an "unknown" element. The unknown element profile is used to define privilege settings where an unknown person or undefined change in an element occurs.

It will be appreciated that, although the calibration process has been described as a manual calibration process, the calibration process can also be

performed in an automatic mode by scanning a presentation space to search for predefined classes of elements and for predefined classes of users.

Once calibrated, presentation system 10 determines a desire to view content and enters a display mode (step 120). Typically this desire is indicated using user interface 38. However, presentation system10 can be automatically activated with controller 34 determining that presentation system 10 should be activated because, for example, controller 34 is programmed to activate presentation system 10 at particular times of the day, or because, for example, controller 34 determines that a new signal has been received for presentation on the display.

Signal processor 32 analyzes signals bearing content and determines access privileges associated with this content (step 130). The access privileges identify a condition or set of conditions that are recommended or required to view the content. For example, MPAA ratings can be used to determine access privileges. Alternatively, the access privileges can be determined by analysis of the proposed content. For example, where the display is called upon to present digital information such as from a computer, the content of the information can be analyzed based upon the information contained in the content and a rating can be assigned. Access privileges for a particular content can also be manually assigned during calibration.

In still another alternative, an audience member can define certain classes of content that the audience member desires to define access privileges for. For example, the audience member can define higher levels of access privileges for private content. When the content is analyzed, scenes containing private content can be identified by analysis of the content or by analysis of the metadata associated with the content that indicates the content has private aspects. Such content can then be automatically associated with appropriate access privileges. Presentation space A is then sampled (step 140). In this embodiment, this sampling is performed when image capture unit 42 captures an image of presentation space A. Depending on the optical characteristics of presentation space monitoring system 40, it may be necessary to capture different images at different depths of field so that the images obtained depict the entire

presentation space with sufficient focus to permit identification of elements in the scene.

The image or images are then analyzed to detect elements in the image (step 150). Image analysis can be performed using pattern recognition or other known image analysis algorithms. Profiles for each element in the image are then obtained based on this analysis (step 160).

The content that is to be presented to presentation space A is then selected (step 170). Where more than one element is identified in presentation space A, this step involves combining the element profiles. There are various ways in which this can be done. The element profiles can be combined in an additive manner with each of the element profiles examined and content selected based upon the sum of the privileges associated with the elements. Table I shows an example of this type. In this example three elements are detected in the presentation space, an adult, a child and an open door. Each of these elements has an assigned profile identifying viewing privileges for the content. In this example, the viewing privileges are based upon the MPAA ratings scale.

Viewing Privilege Type (Based On MPAA Ratings)	Element I: Adult Profile	Element II: Child Profile	Element III: Open Door Profile	Combined Privileges
G – General Audiences	YES	YES	YES	YES
PG – Parental Guidance Suggested	YES	YES	NO	YES
PG-13 – Parents Strongly Cautioned	YES	NO	NO	YES

As can be seen in this example, the combined viewing privileges include all of the viewing privileges of the adult even though the child element and the open door element have fewer viewing privileges.

The profiles can also be combined in a subtractive manner. Where this is done, profiles for each element in the presentation space are examined and

the privileges for the audience are reduced, for example, to the lowest level of privileges associated with one of the profiles for one of the elements in the room. An example of this is shown in Table II. In this example, the presentation space includes the same adult element, child element and open door element described with reference to Fig. 1.

Viewing Privilege Type (Based On MPAA Ratings)	Element I: Adult Profile	Element II: Child Profile	Element III: Open Door Profile	Combined Privileges
G – General Audiences	YES	YES	YES	YES
PG – Parental Guidance Suggested	YES	YES	NO	NO
PG-13 – Parents Strongly Cautioned	YES	NO	NO	NO

However, when the viewing privileges are combined in a subtractive manner, the combined viewing privileges are limited to the privileges of the element having the lowest set of privileges: the open door element. Other arrangements can also be established. For example, profiles can be determined by analysis of content type such as violent content, mature content, financial content or personal content with each element having a viewing profile associated with each type of content. As a result of such combinations, a set of element viewing privileges is defined which can then be used to make selection decisions.

Content is then selected for presentation based upon the combined profile for the elements and the profile for the content (step 170). The combined element profiles yield a set of viewing privileges. This set of viewing privileges can be compared to privilege information derived from the content profile. Content having a set of access privileges that correspond to the set of viewing privileges is selected for presentation. In the example shown in Table I, content having a PG rating can be selected for presentation because the PG rating corresponds to the combined viewing privileges which include G, PG, and PG-13

rated content. Conversely, in the example shown in Table II, the same content having a PG rating cannot be presented because the PG rating does not correspond to the combined viewing privileges, which, in the case of Table II, are limited to a G rating. As noted above the viewing privileges and access privileges can be assigned in different ways. Accordingly the selection process can be performed in different ways.

For example, where content is received in streams such as multiple cable channels, selected programming, or selected channels can be blocked. Where the content comprises a single stream of content such as a movie that is recorded on a digital videodisk, selected videodisks and/or selected portions of the content can be excised. Financial and other text-based information can be identified by text based context analysis and blocked in whole, or particularly sensitive portions can be excised.

In one alternative embodiment, a primary stream of content is available having portions that are associated with a reduced set of access privileges and portions that are associated with a greater set of access privileges. A secondary stream of content is available having portions of content that correspond to the portions of the primary stream having the greater set of access privileges but with content modified to have a lower set of access privileges. In this embodiment, the step of selecting content for presentation comprises determining that set of the viewing privileges do not correspond to the greater set of access privileges associated with the portions of the primary stream of content and selecting for presentation content from the secondary stream of content to substitute for such portions of the primary stream.

The selected content is then presented (step 180) and the process repeats until it is desired to discontinue the presentation of the content (step 190). During each repetition, changes in composition of the elements presentation space can be detected. Such changes can occur, for example, as people move about in the presentation space. Further, when such changes are detected the way in which the content is presented can be automatically adjusted to accommodate this change. For example, when an audience member moves from one side of the presentation space to another side of the presentation space, then presented

content such as text, graphic, and video elements in the display can change relationships within the display to optimize the viewing experience.

Other user preference information can be incorporated into the element profile. For example, as is noted above, presentation system 10 is capable of receiving system adjustments by way of user interface 38. In one embodiment, these adjustments can be entered during the calibration process (step 110) and presentation space monitoring system 40 can be adapted to determine which audience member has entered what adjustments and to incorporate the adjustment preferences with the profile for an image element related to that audience member. During operation, an element in presentation space A is determined to be associated with a particular audience member, signal processor 32 can use the system adjustment preferences to adjust the presented content. Where more than one audience member is identified in presentation space A, the system adjustment preferences can be combined and used to drive operation of presentation system 10.

As described above, presentation space monitoring system 40 comprises a single image capture unit 42. However, presentation space monitoring system 40 can also comprise more than one image capture unit 42.

As is shown in Fig. 4, presentation system 10 can be usefully applied for the purpose of video-conferencing. In this regard, audio system 26, user interface 38 and image capture unit 42 can be used to send and receive audio, video and other signals that can be transmitted to a compatible remote video conferencing system. In this application, presentation system 10 can receive signals containing content from the remote system and present video portions of this content on display device 20. As is shown in this embodiment, display device 20 provides a reflective image portion 200 showing user 202 a real reflected image or a virtual reflected image derived from images captured of presentation space A. A received content portion 204 of display device 20 shows video portions of the received content. The reflective image portion 200 and received content portion 204 can be differently sized or dynamically adjusted by user 202. Audio portions of the content are received and presented by audio system 26, which, in this embodiment includes speaker system 206.

In the above-described embodiments, the presentation space monitoring system 40 has been described as sampling presentation space A using image capture unit 42. However, presentation space A can be sampled in other ways. For example, presentation space monitoring system 40 can use other sampling systems such as a conventional radio frequency sampling system 43. In one popular form, elements in the presentation space are associated with unique radio frequency transponders. Radio frequency sampling system 43 comprises a transceiver that emits a polling signal to which transponders in the presentation space respond with self-identifying signals. Radio frequency sampling system 43 identifies elements in presentation space A by detecting the signals. Further, radio frequency signals in the presentation space such as those typically emitted by recording devices can also be detected. Other conventional sensor systems 45 can also be used to detect elements in the presentation space and/or to detect the condition of elements in the presentation space. Such detectors include switches and other transducers that can be used to determine whether a door is open or closed or window blinds are open or closed. Elements that are detected using such systems can be assigned with a profile during calibration in the manner described above with the profile being used to determine combined viewing privileges. Image capture unit 42, radio frequency sampling system 43 and sensor systems 45 can also be used in combination in a presentation space monitoring system 40.

In certain installations, it may be beneficial to monitor areas outside of presentation space A but proximate to presentation space A to detect elements such as people who may be approaching the presentation space. This permits the content on the display or audio content associated with the display to be adjusted before presentation space A is encroached or entered such as before audio content can be detected. The use of multiple image capture units 42 may be usefully applied to this purpose as can the use of a radio frequency sampling system 43 or a sensor system 45 adapted to monitor such areas.

Referring to Fig. 5, presentation system 10 and display device 20 are shown as part of a larger diagnostic imaging and records maintenance system 220 on a network 222. In the embodiment of Fig. 5, diagnostic imaging and

records maintenance system 220 includes a patient database 224, which contains patient related content including but not limited to patient data and medical images. Diagnostic imaging and records maintenance system 220 also optionally incorporates one or more image capture systems 226, such as X-ray or ultrasound apparatus or other examination or monitoring equipment that can provide information related to a patient. In the embodiment shown, diagnostic imaging and records maintenance system 220 also comprises an enhanced display apparatus 228 providing features such as stereoscopic 3-D imaging, and a transcription service 230.

As is shown in schematic form in Fig. 5, and in an illustrative perspective view in Fig. 6, display device 20 is located in a viewing room 240 that provides an environment suited to viewing and assessment of patient related content. As is shown in Fig. 6, viewing room 240 incorporates display device 20, enhanced display apparatus 228 and other forms of medical imaging systems including light boxes 232 for viewing conventional medical images, such as x-ray transparencies. Light boxes 232 can optionally have the ability to both permit the viewing of conventional medical images and to provide additional images and information obtained from network 222, telecommunication systems (not shown), and other known medical imaging and information providing devices (not shown). Display device 20 is capable of presenting medical images and information in a way that permits persons 50 and 52 to view image content when they are positioned in presentation space A.

Fig. 7 shows a flowchart depicting a first embodiment of a method for operating a presentation system 10 as a part of diagnostic imaging and records maintenance system 220. As is shown in the embodiment of Fig. 7, in a first step this method, personal identifiers are detected for people located in presentation space A (step 250). This can be done in a variety of ways. In one embodiment this is done using a sensor system 242 provided by presentation system 10. Sensor system 242 scans presentation space A and, optionally, areas adjacent to presentation space A to identify person 216 and person 218 in or near presentation space A. Sensor system 242 can comprise any form of presentation space

monitoring system 40 described above and can monitor presentation space A and other areas using the techniques described above.

In the illustrative embodiment of Figs. 5, 6, and 7, the step of detecting personal identifiers in presentation space A is performed by detecting a personal identifier 234 associated with each person 216 and 218. In particular, in the embodiment shown in Figs. 5, 6 and 7, each personal identifier 234 has a radio frequency transponder such as those described above and sensor system 242 detects such radio frequency transponders using a conventional radio frequency sampling system 43 such as a transceiver as is also described above.

In an alternative embodiment, viewing room 240 can comprise any restricted access area having a limited set of entrances such as a door 244 that does not permit persons such as persons 216 and 218 to access viewing room 240 unless the persons 216 and 218 a personal identifier 234 to a sensor system 242 that controls access to viewing room 240 by controlling operation of door 244. In this way, persons 216 and 218 cannot enter presentation space A without first providing a personal identifier. In this way, the personal identifier for each person in presentation space A can be determined. Using this embodiment, sensor system 242 can comprise a radio frequency sensing system as is described above, or can comprise the magnetic card stripe reader, an optical card reader or like device.

Each detected personal identifier 234 provides information that can be used to identify a person such as person 216 or person 218 associated with personal identifier 234. Controller 34 uses this identifying information to determine a profile for each detected personal identifier (step 252). This can be done in a variety of ways. For example, each personal identifier 234 can have a memory, not shown, with profile information stored therein that is associated with the person bearing personal identifier 234. In another embodiment, diagnostic imaging and records maintenance system 220 can also incorporates a person database 236 that maintains information such as a profile for each person authorized to observe medical records and that provides information from which display controller 34 or database 222 can determine whether to permit the person to have access to particular medical records.

The profile for each person can also incorporate authentication information. Where such authentication information is provided, an optional authentication step 254 can be performed. The authentication information identifies an authentication action that the person that is identified is to perform and information about that action that can be used to ensure that the person who physically presents personal identifier 234 is actually the person that the system assumes is associated with personal identifier 234. The authentication action can comprise, for example, the entry of a password, a personal identification number, a voice signal, presenting a biometric feature a person's body for biometric input such as a thumbprint scan, retinal scan, or other such input. An authentication input system 229 shown in Fig. 5 as an audio input system, receives such an authentication input and generates an authentication signal. The received authentication signal is compared to an authentication signal that is associated with the personal identifier 234. Where the received authentication signal corresponds to the authentication signal associated with the personal identifier 234, the identity of the person bearing personal identifier 234 can be considered to be authentic.

It will be appreciated that profiles can be assigned to personal identifiers that are uniquely associated with the person. Alternatively, classifications type profiles can be provided for each personal identifier 234. Where this is done, each personal identifier classifies each person associated with the personal identifier 234 within a class a persons. Viewing privileges are assigned for each detected personal identifier 234 based upon the class of person associated with that personal identifier 234.

Once controller 34 identifies and optionally authenticates the identity of each person in a presentation space A, patient content associated with such persons can be obtained. This is also done using information stored in the profile for each personal identifier (step 256). In this regard, each profile can contain viewing privileges that identify specific or general classes of patient content that each person in presentation space A is entitled to observe. Controller 34 and audience member 50 can use these viewing privileges to determine whether to present or provide patient content associated with particular patients.

For example, certain types of patient content can be automatically considered to be of a confidential nature requiring particular viewing privileges based upon legal definitions and institutional policies. Alternatively, access privileges can be assigned to selected patient content that more specifically defines levels of viewing privileges required to observe such content. In this alternative, controller 34 simply compares the access privileges of selected content with the viewing privileges associated with a person such as person 216 to determine whether selected content is to be made available.

As noted above, it is often the case that more than one person will be located in presentation space A when selected content is to be presented. In such circumstances, viewing privileges are obtained for each person from profiles associated with each personal identifier 234 detected in presentation space A or, optionally, adjacent to presentation space A, are combined in order to determine viewing privileges to be used to determine whether selected content is to be obtained. These viewing privileges can be combined in an additive or subtractive manner as is also described above.

Content that is based upon the obtained patient content can then be presented. The presented content can comprise for example, the actual patient related content obtained, and patient content that is derived from obtained patient related content. For example, the presented content can comprise summaries of the patient content statistical analyses of the content, charts and graphs based on the obtained patient content and/or warnings and alerts based upon the obtained patient content.

Because it is often the case that persons will be associated with the treatment of more than one patient, controller 34 can be operable in a mode that determines which patient content is associated with persons such as person 216 and person 218 who are in presentation space A, and that causes a listing of available patients associated with detected persons as these persons are first detected. This listing can be provided a way that does not contain confidential medical or other patient content. Where such a listing is provided the step of authentication (step 254) can be deferred until a selection is made from the listing.

As is shown in Figs. 5 and 6, viewing room 240 can contain sources of light other than display device 20 such as overhead lighting 238 which can generate light that interferes with the presentation of content by display 10. Accordingly, presentation system 10 can have a controller 34 that is adapted to interact with ambient lighting such as overhead lighting 238 and adjusts the lighting to improve the perceived appearance of presented content. Such adjustments can be made based upon the type of content, and profile information. Similarly controller 34 can also be adapted to adjust and/or to control the operation of enhanced display apparatus 228 or light box 232 so that they do not present content to people who do not have appropriate viewing privileges or who are not authenticated.

The invention has been described in detail with particular reference to certain preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention. In this regard it will be appreciated that the various components of the presentation system 10 shown in Fig. 1 can be combined, separated and/or combined with other components to provide the claimed features and functions of the present invention.

PARTS LIST

10 presentation system
20 display device
22 source of image modulated light
24 display driver
26 audio system
30 control system
32 signal processor
34 controller
36 supply of content
38 user interface
40 presentation space monitoring system
42 image capture unit
43 radio frequency sampling system
44 taking lens unit
45 sensor system
46 image sensor
48 processor
50 audience member
51 wall
52 audience member
54 audience member
56 door
58 window
60 source of element profiles
110 obtain calibration images step
112 identify elements in calibration images step
114 define profiles for identified elements step
120 enter display mode step
130 determine content profile step
140 sample presentation space step
150 detect elements step

160 determine profiles for elements step
170 select content based upon element profiles and content profile step
180 present selected content step
190 continue step
200 image portion
202 user
204 content portion
206 speaker system
216 person
218 person
220 diagnostic imaging and records maintenance system
222 network
224 patient database
226 image capture system
228 enhanced display apparatus
229 authentication input system
230 transcription service
232 light box
234 personal identifier
236 personal database
238 overhead lighting
240 viewing room
242 sensor system
244 door
250 detect identifiers step
252 determine profile step
254 authentication step
256 obtain patient related content step
258 present content step
A presentation space